

(12) **UK Patent Application** (19) **GB** (11) **2 177 311 A**

(43) Application published 21 Jan 1987

(21) Application No **8615891**

(22) Date of filing **30 Jun 1986**

(30) Priority data

(31) **8516730**  
**8516729**

(32) **2 Jul 1985**  
**2 Jul 1985**

(33) **GB**

(51) INT CL<sup>4</sup>

**A61M 16/00**

(52) Domestic classification (Edition I):

**A5T AD**  
**A5R CY**

(56) Documents cited

|                   |                      |                   |
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| <b>GB 1585091</b> | <b>GB 0835154</b>    | <b>US 4384576</b> |
| <b>GB 1469274</b> | <b>EP A1 0140487</b> | <b>US 4226233</b> |
| <b>GB 1455452</b> | <b>US 4495947</b>    | <b>US 4076021</b> |

(58) Field of search

**A5T**  
**A5R**  
**Selected US specifications from IPC sub-class A61M**

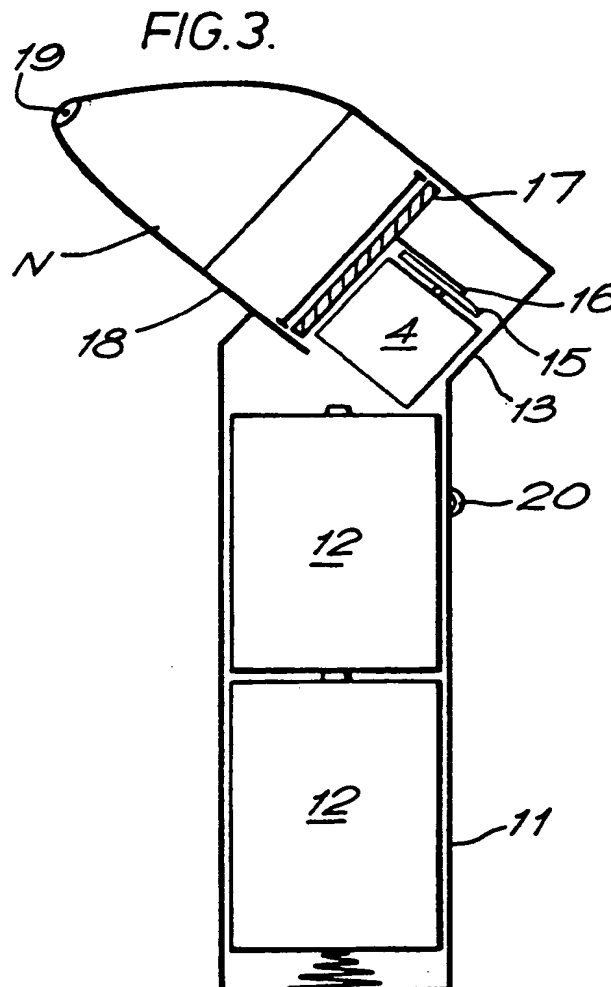
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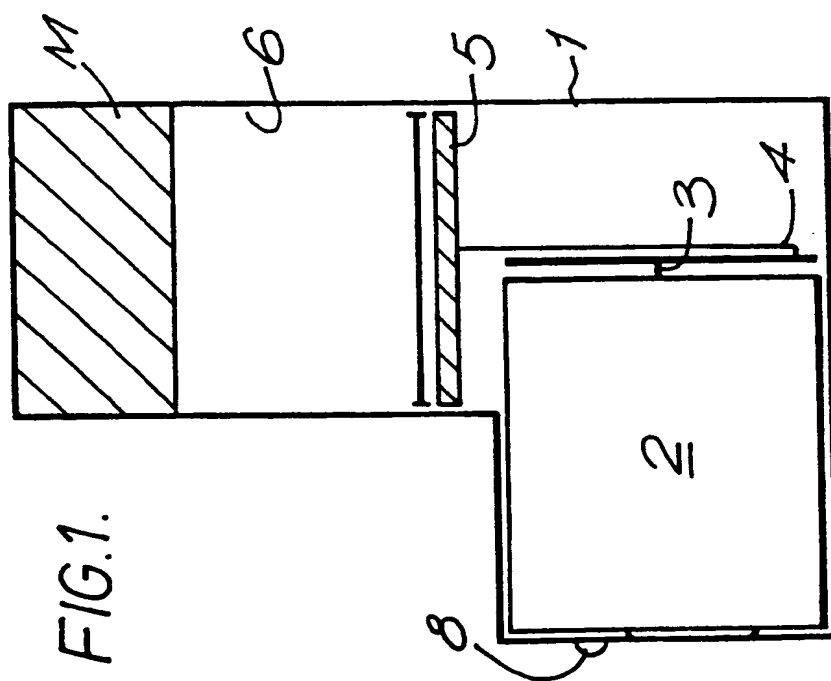
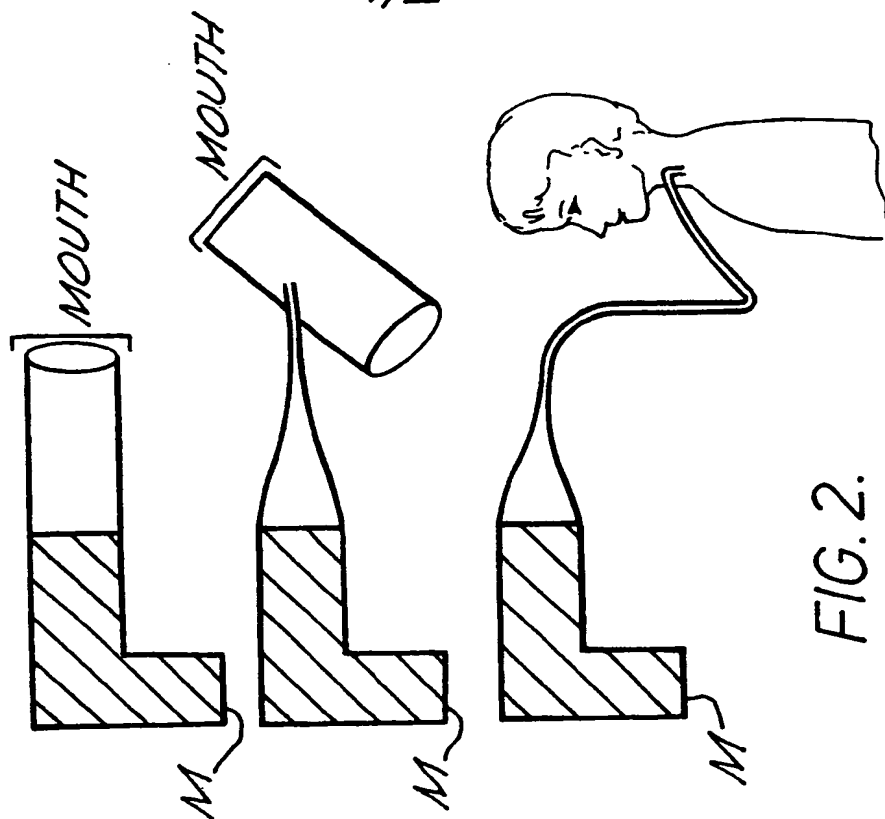
(54) **Ventilatory apparatus**

(57) Ventilatory apparatus for assisting breathing or removing congestion from nasal passages (as shown) comprises a power motor 4 and means 15, 16, 17 for producing low volume high frequency air oscillations.

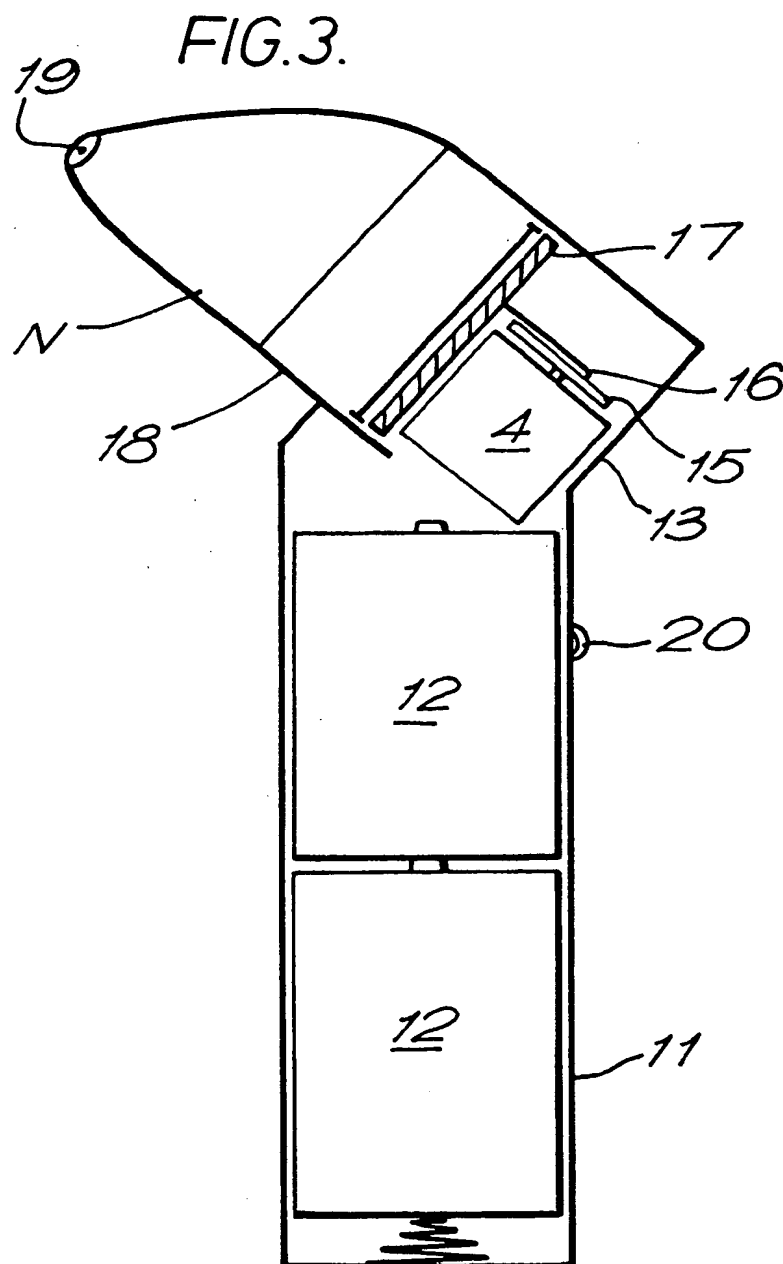


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## SPECIFICATION

### Ventilatory apparatus

- 5 This invention relates to ventilatory apparatus for lung ventilation for example for the clearance of lung secretions or for clearing congestion from nasal passages and airways.

- 10 It is one object of the invention to provide apparatus, preferably portable apparatus, for use by persons for the purposes specified incorporating means for the application of a low volume of air or other gas under high frequency oscillation. Such persons will typically be patients with respiratory problems such as infection, breathlessness or with upper respiratory problems such as head colds, sinus infection, hayfever or the like; geriatrics and invalids.

- 20 According to one aspect of the invention there is provided apparatus for use in enhancing the breathing of a person having breathing difficulties or for freeing nasal passages or passageways of congestion, the apparatus comprising a container, preferably portable, housing a power motor, means for supplying a low volume of air at high frequency oscillation, inlet means arranged to be connected to the mouth, airway or nostrils of the person, and a control switch for powering the means to supply a low volume of air at high frequency oscillation to the part of the person to be treated.

- 35 Most preferably, when air is supplied via the mouth or airway, it is by means of sine wave oscillations at a frequency in the range of from about 5 to about 25 Hertz with a stroke volume of about 5 to 90 ml.

- 40 Most preferably, when freeing air passages of congestive material the air is supplied to both nostrils of the person by means of sine wave oscillations at a frequency in the range of from about 10 to about 15 Hertz with a stroke volume of about 5 to about 15 ml.

- 45 In one feature of the invention the apparatus includes means for the introduction of an agent, typically a medicament, which is beneficially introduced by inhalation. Such an agent may be to relieve congestion, treat infection or exert a local anaesthetic effect.

- 50 By virtue of the apparatus of the invention low volumes of air are introduced into a person having diseased lungs for ventilation, which has been shown to have the subsidiary advantage of improving the clearance of secretions out of the lung or into a person having a disorder of an upper airway to assist in the clearance of secretions from the nose, para-nasal sinuses and eustachian tubes.

- 60 In order that the invention may well be understood it will now be described by way of example with reference to the accompanying diagrammatic drawings, in which

- 65 *Figure 1* is a sectional view of one apparatus, and

*Figure 2* shows three different inlet means for the apparatus of *Fig. 1*, and

*Figure 3* is a sectional view of another apparatus.

- 70 The device of *Figs. 1* and *2* comprises a housing 1 containing a light motor 2 the shaft 3 of which is connected to an eccentric cam 4. This is connected to a piston plate 5 arranged to reciprocate in a cylinder 6. The piston plate 5 may range from about 3 to about 5 cm in diameter, and travel from about 1 cm to about 3 cm.

- A mouthpiece M is present at the end of the cylinder and has an extension which as, shown in *Fig. 2* may be a cylindrical mouthpiece, a fine tube about 1 to 5 mm in diameter to enter the mouth at an angle, or a such a fine tube to enter the airway e.g. trans-tracheally. The motor 2 is energised e.g. by a battery pack, not shown and there is a switch 8.

- In use, the appropriate mouthpiece is selected. The motor is energised from a power source, not shown, and the piston 5 is reciprocated to provide sine wave oscillations of air to the lung at a frequency of about 5 to about 25 Hertz, with a stroke volume of about 5 to 90 ml. The oscillated air has been found to improve clearance of secretions out of the lung, and to provide a ventilatory support to relieve breathlessness in a person with lung disease.

- The apparatus of *Figs. 1* and *2* may be provided with a larger motor, which may be mains driven, able to generate higher pressures. An air inlet may be provided behind the piston. The gas introduced need not be air but could be another gas e.g. oxygen or an air/other gas mixture.

- 105 The device comprises a housing 1 containing two in line batteries 2. The top of the housing 1 is extended and the extension 3 accommodates a light motor 4 the power shaft of which is connected to a wheel 5 which is connected to a rotary cam 6 which is connected to a piston plate 7 which reciprocates in the forward end 8 of the extension. The piston measures about 2 cm to about 4 cm in diameter and travels a linear distance of about 1 cm to about 1.5 cm. A flexible nose piece N is releasably secured to the free end of the extension 4. The nose piece has a pair of end holes 9, one for contact with or reception in each nostril. A finger switch 10 is present to complete the electrical circuit.

- In use, a person suffering from excessive mucus in the airways places the holes 9 of the nose piece N at his nostrils. He then switches on the device and about 5 to 15 ml of air is injected into the nose at a frequency of about 10 to 15 Hertz for a variable period. This clears secretions from the nose, para-nasal sinuses and eustachian tubes. The procedure is repeated until the person feels relief.

The gas introduced need not be air but could be another gas e.g. oxygen or an air/other gas mixture. The device may be a more robust unit than shown, and include a

- 5 larger motor to generate greater pressures. The device may include an inlet grill located behind the piston.

- 10 The apparatus has been exemplified in relation to the treatment of a human being, and it may equally be applied with beneficial results to animals.

#### CLAIMS

1. Apparatus for use in enhancing the  
15 breathing of a person having breathing difficulties or for freeing nasal passages or passageways of congestion, the apparatus comprising a container, preferably portable, housing a power motor, means for supplying a low volume of air at high frequency oscillation, inlet  
20 means arranged to be connected to the mouth, airway or nostrils of the person, and a control switch for powering the means to supply a low volume of air at high frequency oscillation to the part of the person to be  
25 treated.

2. Apparatus according to Claim 1 for connection to the mouth or airway of a person, wherein the air is supplied via the mouth or  
30 airway, it is by means of sine wave oscillations at a frequency in the range of from about 5 to about 25 Hertz with a stroke volume of about 5 to 90 ml.

3. Apparatus according to Claim 1 for use  
35 in freeing air passages or congestive material wherein the air is supplied to both nostrils of the person by means of sine wave oscillations at a frequency in the range of from about 10 to about 15 Hertz with a stroke volume of  
40 about 5 to about 15 ml.

4. Apparatus according to any preceding Claim, including means for the introduction of an agent, such as a medicament.

5. Apparatus for use in ventilation, substantially as described and with reference to  
45 the drawings.

Printed in the United Kingdom for  
Her Majesty's Stationery Office, Dd 8818935, 1987, 4235.  
Published at The Patent Office, 25 Southampton Buildings,  
London, WC2A 1AY, from which copies may be obtained.

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